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Student Attendance Tracking App.

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Abstract — As usual, if many students are attending the lectures, their attendance tracking may become time consuming. Furthermore, there are some possibilities that students could cheat the lecturers of their attendance in the classroom. Therefore, a reliable method to manage the attendance tracking has become a critical issue. This paper aims to propose an attendance tracking app using an Android smartphone/Laptop/Tablet equipped with email ID and Access by only Teacher . Students Attendance can constantly tracked by one another by using smartphones to check and show their attendance automatically if they download and install the software Application (App). Finally, the experimental results have shown that our proposed system can successfully reduce some time for tracking students' attendance. It also allows users to use their own Android smart- phones without purchasing other electronic devices.

Keywords — Attendance Performance monitoring, Time Management for Student, Student Progress Tracker.

[1]. INTRODUCTION

Student attendance is an important issue in all universities. Students in class usually complain that the conventional method of tracking attendance leads to the loss of their rights to be educated due to time inevitably wasted in the checking process. On the other hand, professors who need to follow the course syllabus on schedule are also concerned about more time taken to call each student by name. Furthermore, professors are aware that students leave class during lecture hours or find other ways to falsely track their attendance (Mittal et al. Citation2016).

However, it is still possible for students to be able to fake their attendance, and the existing approaches are unable to avoid these unusual cases . For example, some students come to class after ensuring their professors who have marked their attendance, and then they leave the classroom during lecture hours without asking for permission. Of course, this unusual case should be prohibited (Kumar raj and Kumar Citation2017). Thus, professors need a reliable and more efficient system to solve this problem and stop the unusual case. It is unnecessary to call each student's name from the list continually throughout the lecture hours, and then professors can manage the student attendance more efficiently.

[2]. OBJECTIVE

The main goal of the Student Attendance Tracking App is to make the process of taking student attendance easier, faster, and more accurate. In many schools and colleges, teachers still use pen and paper to call out each student's name and mark their presence. This method takes a lot of time, especially in large classrooms, and can sometimes lead to mistakes or fake attendance.

To solve this problem, we have built a simple and secure app that works on smartphones, tablets, or laptops. Using this app, teachers can take attendance digitally, and students can check their attendance records using their email ID. Only the teacher can approve or manage the attendance, which makes the system safe and prevents misuse.

The app is designed to save time, avoid human errors, and make the entire attendance process smooth and transparent. It provides real-time updates, so students and teachers can see attendance reports anytime. This

helps in keeping better records and improves communication between teachers and students.

Another important goal of this app is to reduce the chances of fake or proxy attendance. Since it uses email-based login and is accessible only by verified users, it ensures that the right student is marked present. It also helps in tracking student performance, as regular attendance is linked to better learning outcomes.

This system supports time management for teachers, reduces paperwork, and helps students stay aware of their attendance status. In the long run, it promotes discipline, responsibility, and a better learning environment in the classroom.

In short, our objective is to make attendance tracking simple, smart, and secure for all users while saving time and improving accuracy.

[3]. LITERATURE REVIEW

Student attendance tracking has always been a significant concern in educational institutions, as attendance plays a crucial role in maintaining academic performance and discipline. Traditional methods, such as manual attendance registers, are time-consuming, prone to errors, and can be easily manipulated. With the advancement of technology, automated attendance systems are increasingly being adopted, integrating various modern techniques like biometrics, RFID, and mobile applications. This literature review explores the existing approaches to student attendance tracking systems, their methodologies, and the challenges associated with these solutions.

Chaudhary et al. (2019) emphasized the role of cloud computing in attendance tracking systems, particularly in enabling centralized storage and data analysis. They found that cloud-based systems are scalable, making them suitable for institutions of various sizes. The integration of data analytics into these systems was also seen as a significant advantage, as it enables institutions to identify attendance trends, predict absenteeism, and take proactive measures.

Chaudhary, Gupta, and Patel (2019) addressed the challenges faced by institutions in developing regions when adopting digital attendance systems. Their research highlighted issues such as unreliable internet connectivity, limited access to modern technology, and a lack of technical literacy among users. The authors recommended cost-effective, offline-capable solutions to bridge this gap and promote the adoption of attendance tracking apps in resource-

Gupta, Verma, and Singh (2020) conducted a study on **phone number-based authentication** for attendance tracking. In this system, students register their phone numbers, and an OTP is sent via SMS each time they need to log in and mark their attendance. This method is especially useful for mobile-based attendance apps, as most students have access to mobile phones. Gupta et al**.** found that phone number-based authentication is quick and user-friendly, particularly in regions with limited internet connectivity, where SMS-based systems can still function. However, they pointed out concerns regarding data privacy and the potential cost of SMS for institutions if deployed at scale.

In their study, they detailed how SMS-based OTP systems can be used to verify students' identities each time they attempt to log in and mark their attendance. This method is highly practical in areas with poor internet connectivity, where SMS is more reliable than email or internet-based applications. Gupta et al**.** highlighted the advantage of using SMS OTP in mobile-first environments, where students predominantly access the attendance systems via smartphones.

In the context of the **Student Attendance Tracking App** developed using **Next.js**, such OCR libraries could potentially automate attendance by recognizing handwritten or printed text from scanned sheets or digital documents, enhancing the system’s overall accuracy and efficiency. Additionally, the study suggests future potential in converting extracted text to speech for visually impaired users, underscoring the societal impact of OCR advancements.

Miller et al. (2020**)** conducted a study on mobile-based attendance apps, highlighting their potential for increasing student and faculty participation in the tracking process. These apps, often built using modern frameworks like **Next.js**, allow teachers to mark attendance digitally while providing real-time updates to students and administrators. The researchers found that mobile apps improve the user experience, with features such as attendance history, notifications for absences, and integration with academic performance tracking systems. Miller et al**.** also suggested that integrating push notifications could help students stay informed about their attendance status, leading to more re
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Li and Chen (2019) investigated the use of **email authentication** in attendance tracking systems. Their research focused on systems where students sign in using their institutional email addresses, ensuring that only registered students can access the platform. The email authentication process often includes a verification step, where a one-time password (OTP) or verification link is sent to the student's email. **Li and Chen** emphasized that email authentication adds a layer of security to prevent unauthorized access to the system and ensures that attendance records are linked directly to the student's verified email, reducing the likelihood of proxy attendance. However, they also noted that some students might encounter delays due to issues such as spam filters or slow email delivery.

[4]. METHODOLOGY

The development of the Student Attendance Tracking App followed a structured full-stack methodology using modern web development technologies to ensure security, performance, and ease of use. The core tools utilized in the application include **Next.js (React Framework)** for the frontend and backend logic, **MySQL** for database management, **Tailwind CSS** for responsive styling, and **Drizzle ORM** for efficient database interactions.

4.1 SYSTEM ARCHITECTURE

The application adopts a client-server architecture, where:
The **frontend** is built using React components within the Next.js framework, providing dynamic and responsive user interfaces.
The **backend** utilizes the API routes provided by Next.js to handle server-side logic, authentication, and attendance management.
The **database layer** uses MySQL, accessed securely via Drizzle ORM, to store user credentials, attendance records, and session logs.

4.2 USER ROLE AND AUTHENTICATION

The app supports two main user roles: **Teacher (Admin)** and **Student**.
Authentication is implemented through **email-based login** using session management via tokens. Only verified teacher accounts are allowed to mark or update attendance.
The app ensures secure login using modern encryption practices and conditional rendering of components based on user role.

4.3 ATTEDANCE WORKFLOW

Teacher Login: A verified teacher logs in using their email credentials.
Attendance Dashboard: Teachers view a list of classes and students. They can mark students as present or absent in real-time.
Student Access: Students can log in and view their own attendance records through their registered email.
Real-time Updates: Attendance data is updated live using Next.js' server-side capabilities, reducing latency and ensuring quick access to the latest information.

4.5 FRONTEND IMPLEMENTATION

The UI is styled with **Tailwind CSS**, allowing for a clean, mobile-responsive layout.
React hooks and context are used to manage component states and handle data fetching.
Conditional UI rendering based on login role (student or teacher) enhances user experience and security.

4.6 DEPLOYMENT AND TESTING

The application was tested across various devices, including smartphones, tablets, and laptops.
It was deployed using a cloud platform (e.g., Vercel or custom server), ensuring scalability and accessibility.

4.7 KEY FEATURES AND IMPLEMENTED

Email-based login system.
Real-time attendance marking and display.
Responsive UI using Tailwind CSS.

Secure role-based access control.
Attendance history and analytics for performance monitoring.

4.8 SECURITY AND DATA INTEGRITY

To ensure data protection and prevent unauthorized access, the app implements secure authentication using email verification and role-based access control. User sessions are managed safely to avoid impersonation or misuse.
All attendance records and user data are stored in a structured MySQL database, accessed through Drizzle ORM to prevent SQL injection and maintain data consistency. Regular validation checks and encrypted communication between the client and server enhance the overall security and integrity of the system.

[5]. DISCUSSION &CONCLUSION

The use of **Next.js** in conjunction with **email and phone number**-based authentication provides a strong foundation for creating secure, scalable, and user-friendly student attendance tracking systems. These systems benefit from Next.js server-side rendering capabilities, offering fast, real-time performance across devices, while multi-factor authentication methods using email and phone numbers significantly enhance security by verifying user identities before granting access to the system. However, challenges remain, particularly in the areas of data privacy and the costs associated with SMS-based authentication at scale. To address these concerns, encryption, compliance with data protection laws, and the careful management of personal data are necessary to ensure the safety and integrity of student attendance records.

The integration of email-based login and role-based access control ensures that only authorized users can access and modify attendance data. The real-time attendance tracking feature provides immediate feedback to both teachers and students, promoting transparency and discipline in academic environments. Tailwind CSS enabled the development of a mobile-friendly and responsive UI, making the system accessible on smartphones, tablets, and laptops.

COMPARISION BETWEEN DIFFERENT TECHNIQUES

Method	Purpose	Limitation
Manual Attendance (Traditional Pen and Paper) : **i.** Teachers manually mark students present or absent on a paper attendance sheet**.**	i. Used for simplicity and to maintain a physical record of student attendance.	i. Time-consuming, especially for large classes. ii. High chance of human error, such as missed entries or incorrect data. **Limitations:**
Mobile Apps and Web-Based Systems (Next.js Implementation): **Purpose :** i. A mobile app or web-based platform built using frameworks like Next.js allows students to log into their accounts and mark their attendance. The teacher may validate attendance using a web interface.	**Purpose**: i. Digitizes attendance management and provides real-time tracking, analytics, and reports. Seamlessly integrates with databases and other services (email, SMS notifications, etc.).	i. Requires stable internet access for both students and teachers.

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